A FEASIBILITY STUDY ON THE UTILIZATION OF A MANPOWER SQUAD FOR SALVAGE AND OVERHAUL OPERATIONS IN THE HOUSTON FIRE DEPARTMENT

Fire Service Financial Management

BY:

Gary M. Vincent
Houston Fire Department
Houston, Texas

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ABSTRACT

The Federal Emergency Management Agency manual, *Risk Management Practices in the Fire Service*, states "Emergency response organizations are viewed as essential public services. Because that is so, emergency managers should recognize that they are responsible for ensuring that their organizations are always ready and able to perform their missions" (Federal Emergency Management Agency, 1996). On two separate occasions within a two-week time frame, the Houston Fire Department was unable to meet that challenge. In both cases, the first scheduled pumper truck was committed to a previous emergency response and a ladder truck without the capability to produce an effective water stream was the first to arrive at a heavily involved structure fire. This inability to produce an effective water stream to initiate a rescue attempt resulted in the loss of three lives, including two children.

The problem identified by the Houston Fire Department, elected officials, and the citizens of Houston was the lack of effective fire and emergency medical service protection when the first scheduled pumper truck was out of service performing salvage and overhaul operations.

The purpose of this study was to determine the feasibility of creating a manpower squad to perform salvage and overhaul operations for the Houston Fire Department and increase the effectiveness of fire and emergency medical service protection for the citizens of Houston.

The action research method was selected to solve the identified problem.

The research questions to be answered by this study were:

1. What are the benefits and cost of creating a manpower squad to perform salvage and overhaul operations in the Houston Fire Department?
2. What funding sources are available to fund a salvage and overhaul manpower squad for the Houston Fire Department?

The procedures utilized in the research included reviewing existing literature, conducting a survey of National Fire Academy students, analyzing Houston Fire Department incident records, identifying equipment needs, and evaluating personnel requirements. Additional procedures utilized included the determination of program expenditures and benefits, developing program alternatives, and presenting the research with recommendations to the Houston Fire Chief for inclusion in the budget and implementation.

As a result of this research, the average time spent performing salvage and overhaul in both the Houston Fire Department and in other fire departments was calculated. The equipment and manpower required, as well as the cost and benefits of creating the Houston Fire Department Salvage and Overhaul Manpower Squad, were also determined. In addition, a new revenue source for the Houston Fire Department was identified. The final result of this research was the inclusion of a Houston Fire Department Salvage and Overhaul Manpower Squad for recommendation and implementation in the fiscal year 2000 budget by Houston Fire Chief Lester Tyra.

The primary recommendation originating from the research was to create and fund the Houston Fire Department Salvage and Overhaul Manpower Squad. Additional recommendations included improving the statistical data gathered by the Houston Fire Department, developing a customer satisfaction survey database, and evaluating additional methods to reduce the out-of-service time of the Houston Fire Department pumper trucks. The final recommendation originating from the research was to determine the dollar value of human life and the Houston Fire Department's public image for future comparative purposes.

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INTRODUCTION

The Federal Emergency Management Agency manual, *Risk Management Practices in the Fire Service*, states "Emergency response organizations are viewed as essential public services. Because that is so, emergency managers should recognize that they are responsible for ensuring that their organizations are always ready and able to perform their missions" (Federal Emergency Management Agency, 1996).

The Houston Fire Department came under intense public scrutiny for its inability to effectively respond to a house fire on January 4, 1996, that resulted in the loss of life for two children (Moran, 1998). This event was the second time in a two-week period that resulted in the loss of life. In both instances, the first arriving fire apparatus was a ladder truck which did not have the capability to produce effective water streams and begin a search and rescue operation. The Houston Fire Chief at that time, Eddie Corral, responded to the criticism by stating that it was not the function of ladder trucks to fight the fires. He concluded that function was reserved for the pumper trucks (Cordes, 1996). In each fire, the first scheduled pumper truck was unavailable due to a previous emergency response. As a result of the public outcry for adequate fire protection and rescue capability, I began to evaluate all operations that caused the first scheduled pumper truck to be unavailable for life threatening emergency responses. In particular, I focused on the out of service time which resulted from a one- or two-story residential structure fire and the ensuing loss of adequate fire protection and emergency medical service protection for the community.

According to the standard operating procedures of the Houston Fire Department, after a fire is under control, the fire scene is left under the supervision of a Senior Captain with a ladder truck crew and one to four pumper truck crews to conduct salvage and overhaul operations.

Mr. Leo Lacamu and Ms. Soneary Sy of the Houston Fire Department's System Development Division, developed data which indicated that the total average out of service time for the first arriving pumper truck and it's crew at a one- or two-family residential structure fire in Houston was 51 minutes. The average time that was required to control the fire was 8.55 minutes. The remainder of the out-of-service time, 42.45 minutes, was spent performing salvage and overhaul operations. This data was based on Houston Fire Department fire records from January 01, 1998, through December 31, 1998.

The problem identified by the Houston Fire Department, elected officials, and the citizens of Houston was the lack of effective fire and emergency medical service protection when the first scheduled pumper truck was out of service performing salvage and overhaul operations.

The purpose of this study was to determine the feasibility of creating a manpower squad to perform salvage and overhaul operations for the Houston Fire Department and increase the effectiveness of fire and emergency medical service protection for the citizens of Houston.

The action research method was selected to solve the identified problem.

The research questions to be answered by this study were:

1. What are the benefits and cost of creating a manpower squad to perform salvage and overhaul operations in the Houston Fire Department?
2. What funding sources are available to fund a salvage and overhaul manpower squad for the Houston Fire Department?

BACKGROUND AND SIGNIFICANCE

At 9 p.m. on December 20, 1995, the Houston Fire Department responded to a one-story house fire in the 1600 block of Cohn Street. Engine-67, the pumper truck that would normally arrive first, was previously committed to another emergency response. Ladder-67 was the first

fire truck to arrive on the scene. Ladder-67 did not have the capability to produce a water stream to attack the fire. Due to the lack of water and the intense fire and heat conditions encountered, the firefighters from Ladder-67 were not able to make entry into the structure and begin search and rescue operations. Mr. Eddie Taylor, 88 years of age, perished in the fire (Tedford, 1997).

On January 4, 1996, the Houston Fire Department responded to a one-story house fire. This fire occurred in the 2100 block of Ellington Street. Once again, Ladder 67 was the first to arrive on the scene. Two children, Crystal Durden, age 3, and her cousin, Alex Freeman, age 4, perished in the fire (Bardwell, 1996). As with the fire at 1600 Cohn Street, the first scheduled pumper truck was not available due to a previous emergency response. In each instance, a ladder truck (the first to arrive on the scene) that was not capable of producing a water stream to fight the fire.

As a result of these events, Mr. Wayne Dolchifino, of television station KTRK Channel 13 in Houston, began a series of investigative reports that aired nightly detailing both the operating conditions of the Houston Fire Department and the responsibilities of the Fire Department. These reports created a sense of outrage in the community and intense public pressure on not only the local elected officials, but Fire Chief Eddie Corral as well. As a direct result of these two incidents, the City of Houston Fire Department was named as the defendant in a wrongful death civil litigation lawsuit which began trial on March 1, 1999. The City of Houston subsequently lost the case.

The loss of trust in the Houston Fire Department by the citizens of Houston was one of the most severe repercussions from these events. The loss of respect for the firefighters, the Fire Chief, and the Command staff was abundantly clear throughout the community. Public scrutiny of the fire department intensified and became the subject of daily reports in both the Houston

Chronicle newspaper and local television stations. The public and local elected politicians were outraged and demanded immediate action to correct the inability of the Houston Fire Department to provide water for firefighting on first arriving fire trucks. The highest-ranking official of the city of Houston at that time, Mayor Bob Lanier, then notified Fire Chief Eddie Corral and Assistant Chief Joe Reyes of expected levels of performance and the consequences of failure to perform. Chief Corral and Assistant Chief Reyes have since been replaced. The current Fire Chief is Lester W. Tyra.

As a result of the intense public pressure and demands that the Houston Fire Department provide adequate fire and emergency medical service protection to the citizens of Houston, I began to evaluate all operations that could cause the first scheduled pumper truck to be unavailable for emergency response. Without a change in standard operating procedures of the Houston Fire Department, the likelihood of a future event producing similar results was high. One area that was immediately identified as a source of potential improvement to reduce the out-of-service pumper truck time was the salvage and overhaul operation of a typical one or two family residential dwelling fire.

During 1997, the Houston Fire Department responded to 1,632 one- and two-family dwelling fires, with 14 deaths, 70 injuries, and $19,179,247.00 of fire loss (Houston Fire Department, 1998). This is the most common type of fire in Houston annually. This category of fire incident accounted for the longest, continuous out-of-service time regularly encountered by the Houston Fire Department pumper trucks, according to Steve Williams, President of the Houston Professional Fire Fighters Association (personal communication, January 26, 1999).

The Houston Fire Department has an annual operating budget of approximately $220 million dollars plus an additional capital improvement project budget of approximately $15 million dollars that requires individual project justifications.

According to information provided by Mr. Leo Lacamu and Ms. Soneary Sy of the Houston Fire Department's System Development Division, the first arriving Houston Fire Department pumper truck averaged 51 minutes out of service at one- or two-family residential dwelling fires. Of the total out of service time, 8.55 minutes were spent fighting the fire with the remainder of the time, 42.45 minutes, spent performing salvage and overhaul operations.

By utilizing the data in the Houston Fire Department's December, 1998, Mayor's Monthly Report, it was determined that during the period from July 1993 through December of 1998, the Houston Fire Department pumper trucks averaged 5.41 minutes responding to all emergency requests (Houston Fire Department, 1998).

The Houston Fire Department needed a method to minimize the out of service time of the pumper trucks at one- and two-family dwelling fires and return them to service to provide fire and emergency medical service protection to the citizens. This would reduce the risk of future fatality incidents for the citizens, increase property protection, improve public relations, and improve the image of the Houston Fire Department. Without a change in the standard operating procedures currently utilized by the Houston Fire Department, the likelihood of a future fire producing a similar loss of life in an already sensitized community and elected public officials seemed likely. I concluded that the risk to the organization of additional damage to its public image and further loss of the public's trust and confidence was high. The solution to the problem was to develop an alternative method to perform salvage and overhaul operations that would minimize the out of service time for the first scheduled pumper trucks.

The International Fire Service Training Association defines overhaul as "those operations that consist of searching for and extinguishing hidden or remaining fire; placing the building and it's contents in a safe condition; determining the cause of the fire; and recognizing and preserving evidence of arson (International Fire Service Training Association, 1985).

Salvage is defined as "those methods and operating procedures that further reduce fire, water, and smoke damage during and after fires" (International Fire Service Training Association, 1985).

It was theorized that many of these functions could be performed by off duty firefighters recalled to duty and formed into a salvage and overhaul manpower squad. They could be placed under the direction and supervision of a Captain, in the same manner as the current standard operating procedures used on ladder trucks. This could be accomplished through the Houston Fire Department's extra-board manpower recall system that is presently utilized to supplement staffing needs. If the equipment to perform those duties was provided, the recalled manpower squad could then be utilized to perform the salvage and overhaul operations at fires. This would allow the pumper trucks with their crews to return to service to provide fire and emergency medical service to the citizens much quicker.

What would it cost to implement and operate this system? Would the benefits to the citizens and the Houston Fire Department justify the cost? Could a funding source for the project be identified? These were unknown areas of concern. Utilizing the techniques studied in the National Fire Academy's Fire Service Financial Management course, the answer to these questions would have to be determined before this system could become a reality. I theorized that the future impact of creating the Houston Fire Department Salvage and Overhaul Manpower Squad would be to improve the fire and emergency medical protection provided to the citizens of

Houston, reduce the risk of future litigation, reinforce the public's trust in the Houston Fire Department, and improve the Houston Fire Department's public image.

LITERATURE REVIEW

In examining the literature and publications related to salvage and overhaul operations in the fire service, I found no previous research on the feasibility of creating a manpower squad to increase the effectiveness of fire and emergency medical service operations for the citizens of any community.

Malcom Getz, writing in Fire Chief magazine stated that "the problem of identifying the efficient firefighting effort is significant for fire chiefs and city government" (Getz, 1978). He declared that " if a change would make the public much more fire safe for a small increase in expenditure, such an increase would be a gain in efficiency" (Getz, 1978). Mr. Getz described a procedure for applying his philosophy on efficiency and effectiveness to determine individual decisions in a fire department. He suggested "a first step is the measurement of the effectiveness of alternative methods. Then the effects might be measured in dollar terms so that they can be compared to costs. Finally, the costs of alternative methods may be estimated and compared with the benefits to indicate whether the efficiency criterion has been met" (Getz, 1978).

Getz utilized fire department records for the basis of his study information. He concluded that "in order to make a case for a specific fire department activity, it is necessary to learn how these results, the fire record, will change for a particular change in the activity" (Getz, 1978). I found no publication that compared any fire department's records prior to and after the creation of a salvage and overhaul manpower squad for effectiveness or efficiency.

I found no literature that specifically identified the costs or benefits of developing a manpower squad to perform salvage and overhaul operations in a fire department. I was able to discover literature that suggested that benefits are more valuable than the face value of the expenditure (Getz, 1978).

Regarding benefits, Getz stated "the avoidance of a dollar of structural damage is likely to be worth more than a dollar to consumers for three reasons. First, contents may be destroyed as well as structures, so the reduction in content losses should be added to the reduction in structural losses. Second, damage estimates do not reflect the costs of the disruption of lives and businesses caused by the fire. Third, most property holders are risk averse, and are willing to pay more than the average value of losses to avoid the small probability of a large loss. Many property holders buy fire insurance where the insurance premium is roughly twice the expected value of losses (reflecting the cost of operating the insurance company). Therefore, the value of one dollar of losses avoided is probably worth more than two dollars" (Getz, 1978).

With respect to the value of casualties, Getz found determination of the valuation of casualties averted difficult. He concluded "no clear valuation is implied for use in valuing saves by the fire department", but did recognize this factor for inclusion in the calculation of the total value of benefits (Getz, 1978).

Getz found costs more easily measured than benefits (Getz, 1978). He suggested that because benefits are measured in annual terms, annualized values are necessary for capital costs" (Getz, 1978).

One of the most important findings that Getz advanced was that due to the inconsistency of fire department record keeping practices, it may only be possible to estimate the relative benefits and costs of alternative operations in the fire service (Getz, 1978).

In the state of Texas in 1996, there was an average of $866.00 in property losses to fire per minute (Texas Department of Insurance, 1996). The report also stated that a fire occurred every 5 minutes in Texas and a structure fire occurred every 20 minutes (Texas Department of Insurance, 1998).

In interviewing Assistant Chief Thomas Slagle, Assistant Chief in Command of the Planning and Research Division of the Houston Fire Department, he stated that the Houston Fire Department did not gather statistical information on the number of citizens rescued annually by the Houston Fire Department (personal communication, February 01, 1999).

When asked how the Houston Fire Department evaluated the cost/benefit value of its salvage and overhaul operations, Assistant Chief Slagle revealed that the Houston Fire Department does not have any methodology for determining the cost or benefits of salvage or overhaul operations within the organization (personal communication, February 01, 1999).

Assistant Chief Slagle was not able to provide any information on the activities of second scheduled pumper trucks when the first scheduled pumper truck was out of service on previous emergency responses. No information gathered by the Houston Fire Department is categorized by scheduled response criteria (personal communication, February 01, 1999).

Assistant Chief Slagle was able to report, through the Houston Fire Department 1997 Annual Report, that the Houston Fire Department fire trucks responded to 134,611 emergencies in 1997 with a total dollar loss of $91,204,608.00 (Houston Fire Department, 1998). He did not have any information regarding the amount of loss in dollars prevented by the Houston Fire Department annually (personal communication, February 01, 1999).

The Houston Fire Department 1997 Annual Report listed that the Houston Fire Department responded to 1,632 one and two family residential dwelling fires in 1997 (Houston Fire Department, 1998).

One of the funding related topics that I was able to find literature on was the use of contractors to provide services to the forestry firefighting industry. Jason Greenlee, writing in *Wildfire* magazine, identified objections to the use of contract firefighters as shortfalls in discipline, equipment standards, training, performance standards, status, and cost (Greenlee, 1994).

Greenlee described one area of great concern with the use of contracted fire employees. He states the "people inside the Forest Service and other large organizations distrust fire contractors" (Greenlee, 1994). He suggested that "skeptics believe that contractors are responsible for many of the fires that they are called to work on" (Greenlee, 1994).

Greenlee indicates that there is a caste system in place with regard to contract fire services. He believes that "contract fire services have a very low status among fire insiders" and they "receive the lowest assignments", of which he considered "mop-up" to be one (Greenlee, 1994).

With regard to the positive aspects of the utilization of contract fire services, Greenlee stated that "governments normally are not willing to invest in equipment that would receive only part time use. The contractor is ideal" to solve that problem (Greenlee, 1994).

He also suggested that retirees and former employees make excellent sources of on-call manpower (Greenlee, 1994).

Another area Greenlee addressed was the lack of standards and training of contractors. He believes that the standards may appear in contracts, but "are not uniformly applied" and

suggested development of across the board standards for training, payment, and equipment for all firefighters, whether in-house or contracted (Greenlee, 1994).

Concerning the cost of utilizing contractors to perform firefighting operations, Greenlee stated that "contractors appear to be costing more than regular crews cost. One informed agency person stated that he paid one and a half times his normal costs on contract crews" (Greenlee, 1994).

Many of the issues addressed by Mr. Greenlee appear to be related to the issues of contracting personnel to perform salvage and overhaul operations for the Houston Fire Department.

In reviewing the literature, I found many comments, such as those written by Harry Carter, which implied that there is a great value placed on salvage and overhaul operations, but no dollar figure for that value was established. Mr. Carter comments that "Your fire department can win friends for itself through a thorough job of properly accomplished salvage and overhaul" (Carter, 1990). He stated, "a number of years ago separate salvage companies operated in a number of cities around America. Most have gone the way of budget cuts, personnel cutbacks, changes in operational procedures and indifference" (Carter, 1990). Carter concluded, "salvage has become a lost art" (Carter, 1990). He went on to justify the importance of salvage operations beginning while the fire attack is being pursued, and described the problems associated with "waiting to use people who may well be too tired from extinguishing the fire to do an efficient job of performing salvage operations" (Carter, 1990). Carter advocated the use of Salvage and Overhaul Squads, but identified an area of concern. Why did the cities that previously created these squads abolish them? The answer was that they did not justify the utilization of the manpower and expenditures in financial terms, and as a result, lost this valuable tool. The

benefit to cost ratio was never established for the Salvage and Overhaul Manpower Squads of the past. When budget cuts came, these squads were seen as a luxury performing duties that regularly assigned fire crews could perform.

What is the difference today? The answer is the number of fire and emergency medical service responses for today's fire crews has increased dramatically over previous years. As a result, today's fire crews must be available for emergency response and do not have the luxury of sitting out of service for extended periods of time to perform salvage and overhaul operations. The Houston Fire Department's number of responses increased from 147,568 in 1993 to 205,490 in 1998, representing a 39.25% increase in just 5 years (Houston Fire Department, 1998).

I was not able to discover any publication that identified sources of funding that had been utilized to develop a manpower squad to perform salvage and overhaul operations in a fire department.

I was successful in discovering several publications that identified sources of funding that could potentially be applied to the development of a manpower squad to perform salvage and overhaul operations for the Houston Fire Department.

The Federal Emergency Management Agency manual, *A Guide to Funding Alternatives for Fire and Emergency Medical Service Departments,* reports that there are "over 25,000 foundations in the United States" (Federal Emergency Management Agency, 1993). According to the manual, "the main resources for information on foundations are the Foundation Center Libraries located in San Francisco, Cleveland, New York City, and Washington D.C." (Federal Emergency Management Agency, 1993). The manual also suggests that "ideas that solve a problem, serve an at-risk population group or community, and that could be evaluated and copied

in other communities would have the best chance of gaining foundation support" (Federal Emergency Management Agency, 1993).

Two other alternative funding sources identified in the manual are local foundations and community service clubs. These foundations and clubs "may be more orientated towards community concerns such as local fire protection, EMS, and rescue than are the large foundations. Proposals for local foundation support should be based upon a well-defined local need" (Federal Emergency Management Agency, 1993).

In addition, corporate donations are identified as a funding source for project development (Federal Emergency Management Agency, 1993). Corporations may also have programs to match the donations made by their employees, sometimes on as much as a three-to-one basis. This technique was successfully used to develop a fire service educational program in Kalamazoo, Michigan, after several children were killed in a structure fire in 1986 (Federal Emergency Management Agency, 1993).

Two other funding sources that could be applied to the development of the Houston Fire Department's Salvage and Overhaul Manpower Squad were described in the Federal Emergency Management Agency manual. These were cost sharing arrangements and contracting out services. Several small communities, whose fire departments have only one or two fire stations, border Houston. When these departments respond to a working fire, these communities are stripped of all fire protection until the incident is concluded. The Houston Fire Department Salvage and Overhaul Manpower Squad could be contracted out to provide service supported by a subscription fee paid by the neighboring communities (Federal Emergency Management Agency, 1993). According to the FEMA manual, the subscription fee would include an initial

entry fee into the program and an annual maintenance fee (Federal Emergency Management Agency, 1993).

PROCEDURES

The action research method was applied to solve the problem identified. The objective of the research was to determine the feasibility of developing a Houston Fire Department Salvage and Overhaul Manpower Squad to reduce the out of service time of Houston Fire Department pumper trucks at one- and two-family dwelling fires. If the Houston Fire Department Salvage and Overhaul Manpower Squad was implemented, then the Houston Fire Department pumper trucks could return to service much quicker than allowed under current operating procedures to provide fire and emergency medical service protection to the community.

What were the costs and the benefits of this proposal? What sources were available to obtain the required funding?

In order to calculate the operating cost of the Houston Fire Department's Salvage and Overhaul Manpower Squad, an average salary by rank was obtained from the Houston Fire Department's human resource division. The staffing level of the Salvage and Overhaul Manpower Squad was set at one Captain, one Engineer/Operator, and two firefighters, the same staffing level currently utilized to staff a pumper company, ladder truck company, or rescue company in the Houston Fire Department.

The staffing expenditure was estimated for the salvage and overhaul manpower squad to provide service 24 hours per day for each of the four shifts currently utilized by the Houston Fire Department.

The extra-board manpower recall system would be utilized to obtain the required personnel to operate the Houston Fire Department Salvage and Overhaul Manpower Squad.

The salary levels used for calculation purposes were Captain, $44,167.24; Engineer/Operator, $41,980.64; and 10-year firefighter, $35,483.24. The 10-year firefighter position was selected as representative of the median point in a 20-year career.

An additional 15% of the total labor cost must be added for the increase in pension contribution as a result of the additional hours worked. Since the Houston Fire Department already employs these personnel and includes all other related expenditures with their personnel costs, no additional expenditures were required for benefits.

The annual operating budget was estimated utilizing average fuel costs of $10.00 per day and annual maintenance repair expenditures of $3000.00.

Two options for the acquisition of the pumper truck and equipment existed.

In both options, the apparatus expenditure was calculated using the current values listed by the Houston Fire Department for a reserve pumper truck. Prior to 1999, the Houston Fire Department routinely sold the reserve fire trucks and their equipment at public auction. Fire Chief Lester Tyra, speaking in *Fire Apparatus* magazine, stated that "the city disposes of it's retired fire trucks at surplus auctions, averaging about $1,300.00 for each truck" (Ballam, 1999).

Beginning in 1999, a new value for the reserve fire trucks was established. The Houston Fire Department recently contracted to purchase 55 new pumper trucks from Emergency One. The contract included an agreement for the apparatus supplier to purchase 54 pumper trucks from the current fleet inventory for fair market value as trade-in. Under the terms of the contract, the Houston Fire Department will receive $717,000.00 for the 54 trucks it is scheduled

to trade in (Ballam, 1999). This contract placed the average value of a reserve pumper at $13,277.00.

The first option was to utilize one of the current reserve fire trucks and purchase all new equipment.

The required equipment list for the Houston Fire Department Salvage and Overhaul Manpower Squad was determined by evaluating the equipment list recommended by the National Fire Protection Association Committee on Fire Department Equipment for salvage trucks. This list was contained in NFPA 1901, Standard for Automotive Fire Apparatus (International Fire Service Training Association, 1985). From this recommended list of equipment, only the equipment currently used by the Houston Fire Department for its salvage and overhaul operations was included in the required equipment list.

The initial equipment expenditure was estimated by calculating current purchase price of the equipment identified in the required equipment list if obtained by the Houston Fire Departments purchasing department (Appendix A). Using this procedure for the acquisition of the needed equipment, the value of the new equipment was calculated as $20,050.00. The total expenditure required for the apparatus and the equipment was valued as $33,237.00.

The second option was to utilize one of the current reserve fire trucks and utilize the used equipment from the current inventory.

The tools and equipment required for the Houston Fire Department Salvage and Overhaul Manpower Squad would be acquired by utilizing the existing used inventory located on the 54 reserve fire trucks prior to selling them to Emergency One. The contract with Emergency One did not include any of the used equipment inventories on the fire trucks. The used equipment inventory would routinely be sold as surplus at auction, with typical values of 10% of new item

values the expected rate of return, according to Assistant Chief Dannie Smith of Fleet Command (personal communication, February 12, 1999). Using this procedure for the acquisition of the needed equipment, the value of the used equipment was calculated as $2,005.00. The total expenditure required for the apparatus and the used equipment was valued as $15,282.00.

This option would completely eliminate the capital outlay requirement for the needed equipment and the apparatus without changing the average value of the other 53 fire trucks, and avoid the costly expenditure for new equipment.

By utilizing current inventory used equipment and one of the reserve pumper trucks scheduled to be sold to Emergency One for the new Houston Fire Department Salvage and Overhaul apparatus, the capital outlay required in the budget for apparatus and equipment would be zero, with an established value of $15,282.00.

In the determination of the benefits of developing a Houston Fire Department Salvage and Overhaul Manpower Squad, the avoidance of loss must be considered the primary benefit.

The avoidance of loss of public trust, the avoidance of loss of the organization's positive public image, and avoidance of involvement in litigation were the primary goals determined to benefit the Houston Fire Department and the citizens of Houston. These goals of reduced litigation, increased public trust, and improved public image were dependant upon reducing the out of service time of first arriving pumper trucks so that they would be available to respond to subsequent fire and emergency medical service emergencies.

To determine how long current operating procedures were requiring the Houston Fire Department pumper trucks to remain out of service while performing salvage and overhaul operations, I reviewed the fire records of the Houston Fire Department for one year. From

January 01, 1998 through December 31, 1998, the Houston Fire Department responded to 2,881 working structure fires (Lacamu, 1999).

The time spent performing salvage and overhaul operations at these fires was calculated by determining the difference between the time when the fire was signaled under control by the Incident Commander and the return to service time of the first arriving pumper fire trucks. The average time spent performing Salvage and Overhaul operations at one- and two-family residential fires was determined to be 42.45 minutes in 1998 (Lacamu, 1999).

It was determined from the 1997 Houston Fire Department Annual Report that the Houston Fire Department responded to 1,632 one- and two-family residential fires in 1997 (Houston Fire Department, 1998). This was the most current report available. Multiplying the average of 42.45 minutes per fire performing Salvage and Overhaul operations in 1998 with the 1,632 one- and two-family residential fires in 1997, I estimated that the time spent performing Salvage and Overhaul operations in Houston annually is 69, 278.40 minutes. This value could only be used for estimation purposes.

In order to validate the reliability of this information, a survey was conducted of 15 students from the National Fire Academy's Executive Fire Officer Program who were attending the Fire Service Financial Management course. The purpose of this survey was to determine the average out of service time for fire trucks performing salvage and overhaul operations in their fire departments. (Appendix B)

In order to calculate the average fire dollar loss per minute in Houston, first the $455,430,434.00 fire loss that occurred in Texas in 1996 was divided by the $91,204,608.00 fire loss that occurred in Houston. Houston accounted for approximately 5% of the fire dollar loss in

Texas. The $866.00 fire dollar loss per minute in Texas was multiplied by 5% to find a Houston fire dollar amount loss of $43.30 per minute (Texas Department of Insurance, 1998).

In order to determine the funding sources that would be required from both within and outside the Houston Fire Department, I conducted a presentation to Fire Chief Lester Tyra concerning the financial requirements to implement the Houston Fire Department's Salvage and Overhaul Manpower Squad. The funding support level from within the Houston Fire Department was determined at this meeting.

The Houston Fire Department's operating budget is approximately 220 million dollars annually. Both the Mayor and City Council must approve the operating expenditures and the capital expenditures for each fiscal year.

The budget is typically approved in the month of June with implementation effective July 1. In the event that the mayor and city council did not approve the funding proposal, alternative sources of funding that had been previously identified during the research would be sought.

The following limitations to this study are noted:

1. The increase in fire and emergency medical service protection for the citizens of Houston can not be accurately measured until the Houston Fire Department Salvage and Overhaul Manpower Squad has been implemented and evaluated over a one-year time period.
2. The reduction in out of service time of the Houston Fire Departments pumper trucks at one and two family dwelling fires can not be accurately measured until the Houston Fire Departments Salvage and Overhaul Manpower Squad has been implemented and evaluated over a one-year time period.

3. I was not able to determine the dollar values for human life or public opinion from the data available.
4. The cost-benefit ratio of providing this service can not be accurately determined until the Houston Fire Department Salvage and Overhaul Manpower Squad has been implemented and evaluated over a one-year time period and the dollar values for human life and public opinion are determined.
5. The fee schedule and income generated from contracting of the Houston Fire Department's Salvage and Overhaul Manpower Squad to surrounding Fire Departments is undetermined at the present time.
6. The values provided by the members of the National Fire Academy's Executive Fire Officer Program were estimated and not determined by accurate scientific measurement.
7. The projected implementation date for the Houston Fire Department's Salvage and Overhaul Manpower Squad program is the beginning of the fiscal year 2000 budget, July 1, 1999.

For the purpose of this research paper, Webster's Third New International Dictionary of the English Language Unabridged was used as the reference source for all terminology definitions (Gove, 1986).

RESULTS

As a result of this research, it was determined that during the period of fiscal year 1993 through December of fiscal year 1999, the first arriving Houston Fire Department pumper trucks had an average response time of 5.41 minutes.

It was determined that during the period of January 01, 1998 through December 31, 1998, the first arriving Houston Fire Department pumper trucks averaged 42.45 minutes out of service performing salvage and overhaul operations at one and two family residential dwelling fires (Lacamu, 1999).

It was also discovered that the Houston Fire Department needed 8.55 minutes to control a fire in a one or two family residential structure fire during 1998 (Lacamu, 1999).

The total out of service time at one and two family residential dwelling fires in 1998 was determined to be an average of 51 minutes (Lacamu, 1999).

Another result of this research was the completion of the National Fire Academy's Executive Fire Officer Program student survey. It was reported from the survey that an average out of service time of 26.8 minutes existed to extinguish a fire with an average additional 100.0 minutes to perform salvage and overhaul operations for the fire departments surveyed. These results were estimated values provided by the respondents and not measured values determined by scientific research. (Appendix B)

As a result of this research, the benefit of creating the Houston Fire Department Salvage and Overhaul Manpower Squad was discovered to be a reduction in out of service time for Houston Fire Department pumper trucks of an average of 42.45 minutes per residential fire.

This would result in an increase in fire protection and emergency medical service protection for the citizens of Houston by the same 42.45 minutes per fire. Since Houston had 1,632 residential fires in 1997, the potential benefit would be to have the first in pumper truck available for an additional 69, 278.40 minutes for these fires.

In the state of Texas in 1996, there was an average of $866.00 in property losses to fire per minute (Texas Department of Insurance, 1998). Since approximately 5% of the fire loss in Texas occurred in Houston, it was calculated that there was a fire loss of $43.40 per minute in Houston. This was information not previously known to the Houston Fire Department.

Using the Houston fire loss value of $43.40 per minute and an availability average of 69,278.40 minutes of fire and emergency medical service protection, it was calculated that the dollar fire loss savings would be $3,006,682.56 annually by having the first scheduled fire truck available for emergency response.

As a result of this study, the estimated annual personnel cost to implement the Houston Fire Department Salvage and Overhaul Manpower Squad utilizing the extra-board recall system was determined to be $722,726.06. This equated to $628,457.44 for personnel cost plus an additional 15%, which equaled $94,268.62 for the pension contribution. The manpower squad would be staffed with one Captain, one Engineer/Operator, and two Firefighters 24 hours per day utilizing the four shifts currently operated by the Houston Fire Department.

The capital outlay for equipment required was determined to be zero. This was accomplished by utilizing one of the reserve fire trucks that was scheduled to be sold as trade in to Emergency One. Although capital outlay required would be zero, the loss of income from the sale of the used fire trucks to Emergency One equaled $13, 277.00. The loss of income from

selling the used equipment at the surplus auction was $2,005.00. The total loss of income was calculated to be $15,282.00.

The annual operating budget was determined to be $6,650.00. This calculation utilized a daily fuel expenditure of $10.00 and an annual apparatus repair cost of $3,000.00.

The total personnel and operating cost of the Houston Fire Department Salvage and Overhaul Manpower Squad would be $729,376.06 annually.

If the Houston Fire Department Salvage and Overhaul Manpower Squad was implemented July 1, 1999, the result would be an estimated out of service time reduction of 42.45 minutes for the first arriving pumper trucks. There would also be a corresponding increase in available fire and emergency medical service protection for the citizens of Houston.

The information to determine the total dollar benefit of implementing the Houston Fire Departments Salvage and Overhaul Manpower squad does not currently exist due to the undetermined dollar value of human life, public trust, and public opinion. One result of this research project was the discovery that these values will not be easily calculated.

One additional result of the research was the discovery of the lack of scientific data upon which to make comparisons and decisions in the Houston Fire Department. Information of a statistical nature is very limited in scope within the Houston Fire Department and the information currently gathered is not in a format that supports efficiency or scientific study.

I also found that very few members of the Houston Fire Department were aware that the Systems Information Division was in existence due to its physical location. The offices are located in the Central Communications Center as part of the Dispatch Center, Computer Repair Section and Fire Records Section. This building is remote to the Fire Chief and Command Staff located in the Houston Fire Department Headquarters building.

As a result of my February 03, 1999 presentation to Fire Chief Lester Tyra, Chief Tyra suggested that the required expenditure for the proposed Houston Fire Department Salvage and Overhaul Manpower Squad would be included in the Houston Fire Department fiscal year 2000 budget proposal. No additional funding above the previously projected level was required for this project, according to Fire Chief Tyra. He stated that all of the required funding for this project existed in his proposed extra-board budget increase (personal communication, February 03, 1999).

What alternative sources of funding could have been identified if the Houston Fire Department Salvage and Overhaul Squad could not have been funded from the Houston Fire Department resources? The alternative sources of funding that were identified as a result of this research project were the Tenneco Foundation, the Shell Foundation, City of Houston reserve funds, alternative city departments, such as the police department, with uncommitted funds in reserve, the Texas Fire Commission grant program, The Houston Fire Museum, Hermann Hospital, the Memorial Hospital System, and corporate sponsors including Coca Cola, Budweiser, Compac Computer, and Gallery Furniture. Each of these sources of community funding are representative of the alternative sources of funding available within the City of Houston that are not presently utilized by the Houston Fire Department.

Another alternative source of funding that was identified was the companies that provide insurance coverage. By creating the Houston Salvage and Overhaul Manpower Squad, the fire loss would decrease, saving the insurance companies money by reducing the size of the claims. These funds could then be utilized to fund the Houston Fire Department Salvage and Overhaul Manpower Squad.

Another result of this research project was the identification of a new source of revenue for the Houston Fire Department. The fee schedule for contracting the Houston Fire Department's Salvage and Overhaul Manpower Squad is currently under development by the Houston Fire Department Command Staff.

In the past, discussions inside the Houston Fire Department have revolved around what services could be provided to the Houston Fire Department by contract. As a result of this research project, ongoing discussions concerning what services the Houston Fire Department may provide other communities and organizations by contract are ongoing.

DISCUSSION/IMPLICATIONS

Since no previous scientific study on the effectiveness of the creation of a Salvage and Overhaul Manpower Squad had been discovered, comparing the results of this study to others was not possible. In fact, I found that the work of Dr. Malcolm Getz in 1978 as he described the difficulty in measuring fire service benefits continues to be accurate in 1999 (Getz, 1978). The benefits provided by the Fire Service are rarely calculated in dollar values.

The determination of the cost to create the Houston Fire Department Salvage and Overhaul Manpower Squad was much easier to define. The process was identical to the method described by Getz (Getz, 1978).

The discovery that "the avoidance of a dollar of structural damage is likely to be worth more than a dollar to consumers" has substantial implications for future justifications of expenditures by the Houston Fire Department (Getz, 1978).

Another implication that resulted from the study was the positive impact on the minority community. The implication from the literature review was that the benefit would be greatest in

the most economically challenged neighborhoods. In Houston, as with most major American cities, those neighborhoods are minority communities.

The literature review also suggested that "ideas that solve a problem, serve an at-risk population group or community, and that could be evaluated and copied in other communities would have the best chance of gaining foundation support" (Federal Emergency Management Agency, 1993). Many of the foundations contacted expressed particular interest in solving problems for the low income and minority communities.

One area of interest that was identified as a result of this study was the difference between the time estimated to perform Salvage and Overhaul provided by the National Fire Academy students and the calculations of the actual time measured by Houston Fire Department. The difference was statistically significant and warrants further investigation as to the cause.

The discovery that for approximately 42.45 minutes per residential fire, the citizens of Houston are without the fire and emergency medical service protection provided by the first scheduled fire truck is of great concern.

It is really a cause for alarm when the citizens and elected officials realize that for 69,278.40 minutes per year, they are without the fire and emergency medical service protection provided by the first scheduled fire truck.

The solution to the elimination of the risk associated with the 69,278.40 minutes of lack fire and emergency medical service protection for the citizens of Houston is the creation of the Houston Fire Department Salvage and Overhaul Manpower Squad to perform these tasks.

In light of the litigation against the City of Houston and the Houston Fire Department, it is almost inevitable that, without change, similar events will occur again with the same deadly consequences. Having been forewarned about the responsibilities of the Houston Fire

Department to the citizens by the first trial, the public's outcry, and the elected official's responses, the consequences of all future events that are similar should be expected to have exponentially increased risk to the organization.

In analyzing the results of this study, it is my judgement that the creation of the Houston Fire Department Salvage and Overhaul Manpower Squad will not only be a benefit to the Houston Fire Department, elected officials and the citizens, but a reflection of prudent risk management by the Fire Chief.

The exact cost benefit ratio was not able to be determined, but the research indicated that the benefits outweigh the cost. With the potential annual dollar benefit, not counting human life and public image, equal to $3,006,682.56, and the estimated annual personnel and operating cost equal to $729,376.06, the justification for the creation of the Houston Fire Department Salvage and Overhaul Manpower Squad is warranted.

Since the $3,006,682 operating budget represents a .01% increase in the Houston Fire Department's annual operating budget of $220 million dollars, Fire Chief L. Tyra did not require any alternative funding sources to provide the financial support to create the Houston Fire Department Salvage and Overhaul Manpower Squad. He was able to fund the project from existing operating resources. Capital improvement projects are funded from an additional funding budget. These funds are also available to Fire Chief Tyra if needed.

One very important implication that resulted from this study was that the Houston Fire Department has products and services that may be offered by contract to other communities to generate revenue. The only service that the Houston Fire Department had previously offered for contract was Hazardous Materials Response service. The Fire Chief is now considering offering

other services to surrounding communities and organizations as sources of income for the Houston Fire Department.

Another implication that resulted from this study is that the Houston Fire Department has alternative sources of funding within the community that are not currently utilized.

Several future areas of study are needed. One such area is the determination of the dollar value of human life. Without this value, cost benefit comparisons are neither complete nor scientifically valid.

Another area of future study is the methodology to determine the dollar value and benefits of the Houston Fire Departments image. In most businesses that provide a service, the measure of success is profit. For the Houston Fire Department, the most reasonable measure of gauging public image would be a customer satisfaction survey. It is implied from the research that this is one area of which the Houston Fire Department has yet to recognize the true value.

What dollar value should be placed upon the public's opinion of an organization such as the Houston Fire Department? This value is difficult to determine when the citizens do not have alternative providers of the service already in place competing for their business. The implication is that discontent with the present level of service breeds competition by new providers of the service. The loss of customer support is generally fatal to most businesses that have competitors.

RECOMMENDATIONS

The most important recommendation that results from the research is the creation of the Houston Fire Department Salvage and Overhaul Manpower Squad. The research has indicated that it will not only be cost effective, but represents prudent risk management by the Fire Chief.

In addition, creation of the Houston Fire Department Salvage and Overhaul Manpower Squad is recommended because it will allow a substantial increase in fire and emergency medical service protection to the citizens of Houston. At some point within the near future, the Houston Fire Department Salvage and Overhaul Manpower Squad is created, a life or property will be saved because a Houston Fire Department pumper truck was in service and able to respond to an emergency, and not out of service performing salvage and overhaul operations at a previous response.

Another recommendation that results from this study is that the Houston Fire Department conducts regular customer satisfaction surveys to determine its value and image within the community.

Further research into the dollar value of a life saved by the Houston Fire Department is needed in order to develop meaningful cost benefit analysis. The determination of this value has application well beyond the Houston Fire Department.

Another recommendation is that further research should be conducted to determine if a second Salvage and Overhaul Manpower Squad is warranted. Until the usage of the original squad is evaluated, creation of a second squad would be premature.

It is suggested that computer modeling of fire and emergency response request patterns in Houston be developed to increase the effectiveness of resource utilization. Currently, no such modeling is utilized to predict resource needs and to increase resource effectiveness and efficiency.

It is recommended, as a result, of the research that the Houston Fire Department form a committee to evaluate additional services that may be offered to other communities by contract to generate income for the Houston Fire Department. With the resources available to the

Houston Fire Department, it would appear prudent to begin to generate income based upon the services that can be provided to others who need the services.

Based upon the research conducted, it is further recommended that the Houston Fire Department form a committee to evaluate alternative funding sources that are available. At this time, it appears that there is no consideration given to alternative funding sources, which could generate substantial income, or allow reallocation of existing resources for utilization by the Houston Fire Department.

I would also recommend that the Systems Development Division of the Houston Fire Department be relocated to the same building as the Fire Chief and the Command Staff. It appears from the personal interviews that many members of the Houston Fire Department management team fail to recognize the value of this resource in its present physical location.

One of the most important recommendations to surface from the research is the level of funding available to the Houston Fire Department Fire Chief. There was not any degree of difficulty in identifying sources for the creation of the Houston Fire Department Salvage and Overhaul Manpower Squad. It was even more revealing that the Houston Fire Chief had such large amounts of funding available at his disposal. As such, I must recommend that a more restrictive system of checks and balances be implemented to safeguard the public's funds.

Additional research into other alternative methods to reduce the out of service time of fire trucks appears to be warranted. The research has demonstrated that the risk to the citizens and the organization may be substantial. In the case of former Fire Chief E. A. Corral, one out of service pumper truck was a 40-year career-ending event. The public and the elected officials have clearly demonstrated their resolve to have the Houston Fire Department meet its

obligations. It is my recommendation to all involved that they take heed to the message that has been sent by the public.

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APPENDIX A

HOUSTON FIRE DEPARTMENT SALVAGE AND OVERHAUL MANPOWER SQUAD REQUIRED EQUIPMENT LIST

Item No.	Quantity	Description	Cost
1	1	1000 GPM Class A Pumper Truck with Radio	$413.277.00
2	4	Scott 4.5 Self-Contained Breathing Apparatus	$10,000.00
3	2	12 Foot Pike Poles	$300.00
4	4	6 Foot Pike Poles	$200.00
5	4	Shovels	$100.00
6	4	Fire Axes	$160.00
7	450 Feet	1.75” Fire Hose	$630.00
8	300 Feet	4.00” Fire Hose	$2,000.00
9	10	Fire Hose Adapters	$1,000.00
10	2	1.75” Fire Hose Nozzles	$1,000.00
11	20	Salvage Covers	$2,000.00
12	2	Rotating Saws	$2,000.00
13	2	Chain Saws	$600.00
14	2	Pry Bars	$40.00
15	2	Hammers	$20.00
		TOTAL	$33,327.00

APPENDIX B

Data for question #5 was utilized to calculate the average out-of-service time for the fire departments represented by the National Fire Academy Executive Fire Officer students.

Data for question #7 was utilized to calculate the average time it takes to extinguish an average fire for the departments represented by the National Fire Academy Executive Fire Officer students.

The survey form used is shown below.

Overhaul Operations Survey

1. What is the standard number of Engine Companies and Ladder Companies that respond to a structure fire in your community?

   Engines_____ Ladders_____

2. What is the standard number of personnel on an Engine Company in your community?

   Officers_____ Engineers_____ Firefighters_____

3. What is the standard number of personnel on a Ladder Company in your community?

   Officers_____ Engineers_____ Firefighters_____

4. What is the hourly salary rate of the following personnel in your community?

   Officers_____ Engineers_____ Firefighters_____

5. After a structure fire is extinguished, how long do your crews spend performing overhaul operations?_____

6. What is the total out-of-service time for the first arriving Engine Company at most structure fires in your community?_____

7. How long does it take to extinguish the average structure fire in your community?

   _____

8. What is the average response time by the first arriving Engine Company to the middle of an area that is unprotected due to a previous working structure fire?_____

9. Does your fire department utilize the same firefighters that extinguished the fire to perform overhaul operations? (Yes) (No) _____

10. Does your fire department utilize off-duty recalled manpower crews to perform overhaul? (Yes) (No) _____

11. Does your fire department utilize non-firefighter manpower crews to perform overhaul? (Yes) (No) _____

12. How many structure fires occur in your community annually?_____

Thank you for your participation.

Survey Results

Student Number	Question Number 5	Question Number 7
1	60	20
2	120	15
3	120	30
4	60	20
5	45	20
6	120	60
7	180	34
8	45	20
9	300	20
10	180	28
11	120	50
12	30	15
13	45	40
14	30	10
15	45	20
Total	1500	402
Average	100	26.8